XLII.—*On some Works relating to a new Classification of Ammonites.* By Ernest Favre*.

The abundance with which Ammonites are distributed in the deposits of the secondary epoch, the variety and beauty of these fossils, and their importance in the classification of strata have long attracted the attention of naturalists. When the known species of this group increased in number, and a greater diversity of forms was discovered, the necessity of introducing some subdivisions among them came to be felt. Nevertheless, as no representative of this genus has yet been found living, and the organization of the animal was and still is in great part unknown, the various classifications proposed were only based on the most apparent characters of the shell—that is to say, on its general form, the nature of its ornaments, and that of the septa. Thus it was that the Ammonites were divided into various families, the *Heterophylli*, *Globosi*, *Ornati*, *Cristati*, &c.

The great works of M. Barrande on the Cephalopoda of the Silurian strata, the development of palæontological collections, and a very complete study of the anatomy of the *Nautilus* (the only tetrabranch now living) have thrown, within the last few years, a new light on the organization of the Ammonites. Important characters have been recognized, and have served as a basis for a classification into various groups which have been called genera. In this way a number of new names, such as *Arcestes*, *Phylloceras*, *Perisphinctes*, &c., of which the use has not yet spread beyond a certain number of palæontologists, have been introduced into certain works published in Germany. The new classification†, however, is not complete; and it relates especially to the Ammonites of the Jurassic formation, of which the museums of Munich and Vienna possess admirable collections. Moreover the naturalists who have created and adopted it still retain the old designation for the Ammonites from this formation which are not yet classed, as well as for the greater part of the Cretaceous Ammonites, until new materials enable the work to be completed.

Professor Suess has the merit of first drawing attention to the characters which may serve to establish a new classification of Ammonites, and directed in a quite different course from his predecessors' the researches on this group. M. Laube, M.

* Translated by W. S. Dallas, F.L.S., from the Bibliothèque Universelle, Archives des Sciences, January 15th, 1873, pp. 1–23.

† I shall not speak here of an attempt at classification which has been made in America by Prof. Agassiz and Mr. Hyatt, and which rests upon very different principles from those of the German classification.

Zittel, and M. Waagen afterwards, especially occupied themselves with this question*. The classification proposed by M. Suess rests in great part on the size of the last chamber and on the nature of the appendages to the mouth of the shell, which he believes to be in relation with the essential characters of the animal. That of M. Waagen, whilst taking into account these characters, is based on the nature of the *Aptychus*, which plays, as I shall show, an essential part in the organization of the Ammonite.

The *last chamber*, the size of which is constant in each group of Ammonites, differs much from one group to another. In some of them it occupies as much as one turn and a half, in others hardly half a turn. This difference is often connected, according to M. Suess, with differences in the form of the margin of the aperture, and in important anatomical characters. According to this learned palæontologist, in the Ammonites furnished with a large chamber the adductor muscles were probably placed on the sides near the margin of the shell, which generally presents the form of a crescent. In the much more numerous Ammonites which have a shorter chamber the latter encloses only a part of the animal; the margin of the aperture is then furnished with appendages of various forms, sometimes simple and discoidal (*myothèque*), sometimes more elongated and presenting a myotheca united to the shell by a longer or a shorter peduncle (*myolabe*). As these names indicate, these appendages served, in the opinion of M. Suess, as points of attachment for the muscles.

M. Waagen has opposed this opinion. The muscles have, according to him, a part too important in the organization of the Ammonite, and the life of the animal depends too much upon their preservation, for them to be thus placed on the edge

* The following are the titles of the various works in which this subject is treated:—

1865 and 1870. Ed. Suess, "Ueber Ammoniten," Sitzungsber. k. Akad. Wiss. Wien, lii., lxi.

1868. Zittel, Paläontologische Mittheilungen. Die Cephalopoden der Stramberger Schichten.

1869. Laube, "Ueber *Ammonites Aon* und seine Verwandten," Sitzungsber. k. Akad. Wiss. Wien, lix. 15.

1869. Waagen, "Die Formenreihe des *Ammonites subradiatus*," in Beneke's Geogn.-pal. Beitr. 1869, ii. 183.

1870. Zittel, Paläontologische Mittheilungen. Die Fauna der ältern Cephalopoden-führenden Tithonbildungen.

1870. Waagen, "Ueber die Ansatzstellen der Haftmuskeln beim Nautilus und den Ammonitiden," Palæontographica, herausg. v. Dunker und Zittel, xvii. 185.

1871. Waagen, "Abstract of results of examination of the Ammonite-fauna of Kutch, &c.," Records of the Geol. Surv. of India, 1871.

of the shell, and often beyond this edge on a pedunculated organ, exposed to all sorts of external dangers. The anatomy of the *Nautilus*, in conjunction with observations made directly on well-preserved Ammonites, lead him to a very different result from that obtained by M. Suess. This I shall explain hereafter.

It has long been a question how the animal of the Ammonite advanced in its shell, and how it formed its septa. The mode of progression was evidently the same as in the *Nautilus*. The researches of M. Keferstein, and those of M. Waagen, on the anatomy of the latter animal seem to have settled the question. The animal grows periodically; at certain moments, which are for it a time of repose, it remains fixed: the posterior part of its body, which is free, secretes calcareous matter and forms the septum; at other times this part secretes air, and the animal advances slowly. All its periphery is bound to the shell by a thin layer of conchioline*, of which the outer margin has the form of a ring (*annulus*), marked in the interior of the shell by a band from 1 to 2 millimetres in breadth. The adductor muscles are attached by a thicker coat of the same substance; the marks which they leave on the shell in the last chamber have a perfectly definite form. The whole animal, the posterior part excepted, is therefore united to the shell, and the chamber is hermetically closed.

This explains how the air can accumulate, how the animal can resist variations in the pressure of the air according as it is at a greater or less depth, and also how the soft parts thus sustained could, in the Ammonites, secrete the delicate lobes of the septa always in the same position and on the same spiral line. The mantle extends in front of this attaching ring (*Haft-ring*); it is composed of two parts—one, which is very short, corresponding to the antisiphonal region of the animal; the other, which is much longer, corresponds to the siphonal region, and secretes the shell with which it is connected by its outer margin. Contrary to the opinion of M. Suess, the form of the margins of the aperture has no direct relation with the position of the adductor muscles; it depends entirely on the form of the mantle.

Aptychus.—The most various opinions have been put forward as to the nature and functions of the *Aptychus*†. L. von

* A substance resembling epidermose and containing about C 50, H 6, and N 16·5 per cent.

† M. Coquand published, in 1841, 'Considérations sur les Aptychus,' in which he sums up all the opinions brought forward up to that date as to the nature of these singular organisms. He endeavours to demonstrate that these shells belonged to an extinct family of naked Cephalpooda.

Buch was the first to suppose that they belonged to the Ammonites, and that each species has a determinate form of aptychus. Oppel (Paläont. Mittheil.) demonstrated this fact, and ascertained that they have always a perfectly definite position in the neighbourhood of the siphonal side of the last chamber when the fossil is in a normal state of preservation*.

Three kinds of Aptychus have been distinguished:—*Aptychus* properly so called; *Anaptychus*, which is characteristic of the groups of the *Arietes* and *Amalthei*; and *Sidetes*, of which the Ammonite is not yet known, and which belongs to the Cretaceous formation.

The form of the Aptychus is generally known. The shell consists of three layers of different textures, of which the two external ones are often detached. The inner layer is thin, homogeneous, and often impregnated with organic substance; it is marked with fine lines of growth, and sometimes also with radiating lines. The middle layer, which is the thickest, is distinguished by its structure of juxtaposed canals.

The outer layer disappears easily; it has not always been observed. In the thick Aptychi of the *Perarmati* (*A. cellulosi*) it is very thin and pierced with very small holes; in the Aptychi of the *Flexuosi* and *Falciferi* (*A. imbricati*) it forms a thin homogeneous layer, destitute of pores, which often becomes detached; in the Aptychi of the *Planulati* it is covered with small points. It is particularly developed in the Aptychi of the Alpine strata; in many of them (*A. punctati*, Zitt.) the surface of the thick middle layer is, as in the *Imbricati*, garnished with imbricated folds. But while in these last the outer layer is very thin, it is thickened in the others so as to fill up the intervals of the projecting folds, so that well-preserved specimens seem nearly smooth; their surface is covered with round pores, which are sometimes pretty large, arranged in a radiating order, each row corresponding to a furrow of the middle layer. *A. profundus*, Pict., *alpinus*, Gümb., *striato-punctatus*, Voltz, *cuneiformis*, Oost., *radians*, Coq., and *Malbosi*, Piet., present this structure. We do not yet know to what group of Ammonites they correspond; for they are very abundant in certain beds of the Alps, in which Ammonites are scarcely ever found. This fact, which has repeatedly furnished an argument against the opinion that the Aptychus is an integral part of the Ammonite, may be explained in various ways. We may suppose that after the death of the animal

* M. Schluter has ascertained that the aptychus of the Scaphites occupied exactly the same position (Cephal. der ober. deutsch. Kreide, 1872, pl. 25. figs. 5 & 6).

the Aptychus detached itself from the shell and fell to the bottom of the water, whilst the shell of the Ammonite was thrown on the shore—or, as M. Zittel has supposed, that these organisms belong to a group of naked Tetrabranchs.

What is the part played by the Aptychus in the Ammonite? The *Nautilus* presenting nothing like it, it was difficult to determine its function. Voltz found its analogue in the operculum of the Gasteropoda. Von Buch and Quenstedt regard it as an internal shell. Keferstein has put forward the opinion that the Aptychus might be a protecting organ of the nidamentary glands of the female Ammonite. M. Zittel has corroborated this opinion by several proofs; and M. Waagen has made it a certainty.

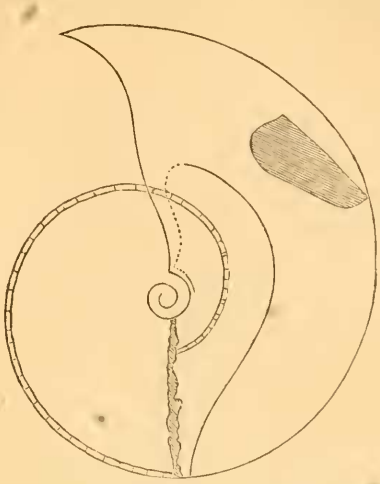
The normal position of the Aptychus in the Ammonite is so closely related to that of the nidamentary gland in the female *Nautilus*, that it seems difficult to assign to it a different function. Moreover the soft tissue of this gland has a great resemblance in its various parts to the structure of the different types of Aptychus, and the form of the Aptychus corresponds very well with that of the outer part of this gland. These various characters indicate therefore almost certainly the purpose which it serves, although in no living Cephalopod has there been found a similar thickening of the teguments of these glands. We may add, as an indirect proof, that no other organ exists in the *Nautilus* with the analogue of which the Aptychus could have been connected in the Ammonite.

It is evident that it could not have served to close the aperture of the shell. This opinion, which has been repeatedly maintained, and quite recently by M. Lehon*, has been refuted by M. Waagen. The museum at Munich contains a hundred specimens of Ammonites still provided with the Aptychus. Only five of them present the Aptychus placed perpendicularly to the aperture, as M. Lehon has shown it. In all the others it is deeply immersed in the shell in the position here figured (see opposite), a position which corresponds with that of the nidamentary glands of the *Nautilus*†. M. Waagen shows besides, by measurements of *Amm. steraspis*, that the dimensions of the Aptychus by no means agree with those of the aperture. Moreover its presence in Ammonites provided with appendages to the aperture proves evidently that it never plays the part of an operculum; for these appendages often approach each other towards the apex, and would have entirely paralyzed its movements. Keferstein, who had recognized the true

* Bull. de la Soc. Géol. de France, 1870, vol. xxvii. p. 10.

† See, for the position of these glands in the *Nautilus*, the excellent figure given as the frontispiece to Woodward's Manual.

function of the Aptychus, believed that the Anaptychus served as an operculum: it occurs, however, in the same position as



A. steraspis: figure taken from Waagen, Palæont. xvii. pl. 40. f. 4.

the former of these organs *; and it is therefore evident that it fulfilled the same purpose.

The function of the Aptychus being thus determined, furnishes an important point for the determination of the relative arrangement of the organs in the Ammonite, which may be deduced from that which they occupy in the *Nautilus*. In this animal the nidamentary gland is situated on the siphonal side above the adductor muscle, and outside of the ring of adherence. It is only natural to suppose that the relations of these various organs were the same in the Ammonite. Direct observation serves here to confirm the theory.

Oppel has remarked in a great number of Ammonites from the limestones of Solenhofen a mark of a peculiar form (Paläont. Mittheil. pl. 69). M. Waagen has ascertained that this impression has precisely the same shape as that of the ring of adherence in the *Nautilus* (see the foregoing sketch); it is the trace of the horny margin of this ring, which has been preserved in consequence of the tranquillity of the deposition of the sediments. This trace begins at the margin of the aperture, about in the middle of the sides, follows the spiral of the shell back towards the septum, and then bends forward towards the siphonal side. The Aptychus is above and outside of this

* See *A. planorbis*, Sow., in Waagen, Palæontogr. 1869, xvii. pl. 40. fig. 5.

mark (that is to say, nearer the siphonal side), the same as the nidamentary gland in the *Nautilus*. This important line once ascertained, M. Waagen deduces from it by analogy the position of the adductor muscle, of which the trace is ideally represented in the figure by a dotted line.

Apertural appendages.—We owe to M. Suess a detailed study of these appendages in various groups of Ammonites. In the group of the *Fimbriati* the ventral side shows nothing but a broad, short, and but slightly marked process, while the dorsal margin presents a long appendage which spreads far over the preceding turn. In the *Amalthei*, the *Falciferi*, and the *Cristati* * the keel extends far beyond the anterior margin of the chamber, in a long appendage which M. Suess regards as destined to support and protect the naked part of the body of the Ammonite, and in particular the excretory canal, in those groups which are distinguished by the smallness of their last chamber; this appendage curves outwards in *A. rostratus*†, and inwards in *A. Lamberti*‡. In a great number of Ammonites (*Ornati*, *Coronati*, *Planulati*, *Flexuosi*, *Trimarginati*) the margins of the shell are produced into lateral appendages or auricles of various shapes, which M. Suess regards, as I have already stated, as the points of attachment for the muscles. In the typical *Planulati* the discoidal part and the stalk of these appendages are both well developed; in the *Coronati* the stalk is always short and the disk very large §; in *A. Jason*‖, these two organs are more or less confounded. The often hollow spiral line that we see in many Ammonites (*A. lunula*, *A. canaliculatus*, *A. bifrons*, &c.) is produced as far as this appendage; it is nothing but the trace left by the stalk, which gradually incorporates itself with the shell in proportion as the latter grows, while the discoidal part is very probably subjected to resorption.

If these lateral processes did not serve as points of attachment for the muscles, what could have been their use? The margin of the aperture of the *Nautilus* is also falciform; it is so in a more marked manner in some *Clymeniæ*, and still more in *Orthoceras undulatum*. This process serves in the *Nautilus* for the protection of the head, and in particular of the eye. We may therefore suppose, with much probability, that it fulfilled the

* See *A. Amaltheus* and *A. costatus*, Quenstedt, Jura, p. 162 and pl. 21. figs. 1–3; Cephalopoden, pl. 5. fig. 10 *a*; *A. serpentinus*, Pictet, Traité de Paléont. pl. 53. fig. 2; *A. cristatus* and *A. varians*, D'Orbigny, Céphal. crét. pls. 88 & 92.

† Buvignier, Statistique géolog. de la Meuse, pl. 31. fig. 8.

‡ Quenstedt, Jura, pl. 70. fig. 16.

§ D'Orbigny, Céphal. Jurass. pl. 149. fig. 1, pls. 135 & 139.

‖ D'Orbigny, Céphal. Jurass. pl. 159. fig. 1.

same function in the Ammonite. It occurs constantly in certain genera of Ammonites; but this is not the case with the auricles; and the irregularity in the form and presence of these organs proves that they were not destined to the part M. Suess has attributed to them.

On examining these appendages with care, we see that their length is by no means in inverse proportion to that of the chamber. In the *Amalthei*, in which the chamber forms from half to two thirds of a turn, the margin scarcely presents a slight lateral process; in the *Planulati*, on the contrary, in which it is much longer, the auricles are often well developed. Their presence itself is very irregular, even in the same species; it presents great variations with age: M. Waagen has ascertained that they often disappear at a certain age. Moreover, sometimes, of two Ammonites of the same species and the same size, one presents auricles and the other a simple margin. As examples of this, Waagen cites and figures * two *A. opalinus* obtained at Zaskale, in Gallicia. It is probable that these appendages had some other physiological function. The species furnished with an Anaptychus do not present auricles at any period of their existence; those which have auricles, even if only during their youth, have, on the contrary, a true Aptychus.

The differences which I have just indicated are not sexual differences. In fact, there have been found, at Solenhofen, amongst the Ammonites which contain Aptychi, as many individuals provided with auricles as destitute of them. Now we have seen that the Aptychus is a distinctive sign of the female Ammonite. Certain shells from this same deposit, in which the line of the ring of attachment is still well marked and which have consequently been submitted since their death only to a slow decomposition in which the soft parts alone have disappeared, are not furnished with Aptychi; therefore they never had any, and they evidently belonged to males. Now they do not present any difference from the female individuals, except perhaps a little more strongly marked ornamentation.

The figures of *A. steraspis* given by Oppel (Paläont. Mitth. pl. 69) are very instructive on this point.

The Structure of the Shell.—The shell of the *Nautilus* is composed of two layers—an external layer formed of an aggregate of cells of different sizes, and the largest of which are those nearest the outside (it forms the most important part of the shell properly so called, and M. Suess has named

* Palæontographica, 1869, xvii. pl. 40. figs. 6 & 7.

it *ostracum*), and an internal nacreous layer formed of very small cells, which constitutes the septa and lines the inner surface of the ostracum. The former is secreted by the mantle; the latter by the body of the animal. This same structure has been recognized in many Ammonites, notwithstanding the difficulties which observation presents; it is observed, in particular, in many Ammonites of the *Fimbriati* group.

M. Barrande has established the fact that in many of the palæozoic Cephalopoda the organization was such that not only the animal was entirely lodged in the shell, but it could not put out more than a comparatively restricted number of its organs. This character coexists generally with a great thickness of the shell, due very probably to the nacreous layer, and with certain swellings of this layer which M. Barrande has named organic deposit. The structure of certain Ammonites presents some analogy with this latter fact. In *A. cymbiformis*, of the Trias of Hallstatt, the surface of the ostracum, garnished with the striæ of growth of the shell, is seen continuing regularly without interruption to the anterior margin; and it is only where the shell is broken that we observe on the cast deep periodical furrows, corresponding to so many folds or *varices* which were formed regularly on the inner surface of the shell, and which occur in the youngest individuals. Generally these varices do not represent former apertures; for they are not parallel to the lines of growth of the ostracum, as is seen in *A. Jarbas*. The periodical arrests of growth which are indicated by these varices have nothing in common with those which are necessary for the formation of the septa. The constrictions which are observed in the *Planulati*, for example in *A. polygyratus*, are of a totally different nature; they do not accord with a varix of the interior of the shell, but they are produced by folds in the ostracum, without any change in the thickness of the shell: M. Suess calls them *contractions*. The varices and the contractions have this in common, that in each group they are only observed in those individuals which have the aperture but little elevated; in *Arcestes* they exist in *A. cymbiformis*, but they are wanting in those which have an elevated aperture, such as *A. Layeri*, *Metternichi* (*Pinacoceras*, Mojs.). The varices are only seen in *Goniatites*, *Arcestes*, *Phylloceras*, and *Clymenia*. The contractions are seen in *Lytoceras*, *Perisphinctes*, and many other Ammonites. The distinction of the contractions and the varices seems to agree with that of the great groups of Ammonites.

The wrinkled layer (*Runzelschicht*) is formed by a deposit of calcareous folds in the neighbourhood of the mouth, a

little in front, on the convexity of the preceding turn. It has been observed in the Goniatites by Keyserling, in many Silurian Cephalopoda by M. Barrande, and in the *Clymeniæ* by M. Gümbel; M. Quenstedt and M. von Hauer have recognized it in the Ammonites of the group *Arcestes*; M. Laube in *A.* (*Phylloceras*) *Jarbas*; M. Suess in *Clydonites delphinocephalus*.

This layer extends to a larger or smaller part of the interior of the shell; it becomes gradually effaced and disappears with growth. It appears to be wanting in the genera which present contractions. The Ammonites in which it is found (*Arcestes* and *Phylloceras*) are also those which have varices; by these characters they approach certain palæozoic Cephalopoda; they are also those which appeared first*.

The great differences in the structure of the Aptychi indicate considerable differences in the structure of the nidamentary glands, and consequently in the entire organization of the Ammonites. The various characters which we have enumerated seem fully to justify a division into genera of the fossils of this great group. This new classification is based, then, first of all on the structure of the nidamentary gland; next, on the length of the chamber of habitation; in the third place, on the form of the latter and of the aperture, the septa, and the ornaments. The general form of the shell, to which the older classification attached great importance, seems to be a very variable character, and, in consequence, a secondary one. It is upon these principles that M. Waagen has based the following table:—

A. Nidamentary Gland without solid integument.

Chamber short; appendage ventral ..... Phylloceras, Suess.
Chamber short; appendage dorsal ..... Lytoceras, Suess.
Chamber very long (1½ to 2 turns) ..... Arcestes, Suess.
? Chamber short; apertural margin falciform, with the appendage ventral; ornaments of the same kind as those of the Argonaut .... Trachyceras, Laube.

B. Nidamentary Gland with a solid integument (*Aptychus*).

I. *Gland simple, not divided, with*:—

1. Integument horny (*Anaptychus*).

Chamber very long (1 to 1½ turn); apertural margin with a pointed ventral appendage .. Arietites, Waag.
Chamber from ⅔ to 1 turn; apertural margin with a rounded ventral appendage ..... Ægoceras, Waag.
Chamber short (⅓ to ⅔ turn); apertural margin with a long ventral appendage ..... Amaltheus, Montf.

* These Ammonites are abundant in the Trias. M. Waagen has lately discovered some in the Carboniferous formation in India.

2. Integument calcareous.

Aptychus Numida, Coq. Shell unknown. (Sidetes?) ..... —— ?

II. *Gland double, with the Aptychus calcareous.*

1. Aptychus possessing furrows on the external side.

Aptychus thin, presenting externally a layer of conchioline, which is easily detached. Chamber short; apertural margin falciform, with an acute ventral appendage ..... Harpoceras, Waag.

Aptychus thick, having internally a solid layer of conchioline. Chamber short; apertural margin falciform, with a rounded ventral appendage..... Oppelia, Waag.

Chamber short, having near the aperture a groove or a swelling; apertural margin provided with lateral auricles and a rounded ventral appendage ..... Haploceras, Zitt.

Chamber pretty long; last turn detached from the others..... ? Scaphites, Park.

2. Aptychus thin, granulated externally.

Chamber long; apertural margin simple or furnished with auricles ..... Stephanoceras, Waag.

Chamber long; aperture narrowed by a furrow, simple or furnished with auricles..... Perisphinctes, Waag.

Chamber short; aperture simple or furnished with auricles..... Cosmoceras, Waag.

3. Aptychus thick, smooth, and punctated externally.

? Chamber long. Umbilicus large. Shell with furrows; apertural margin with a nasiform ventral appendage ..... Simoceras, Zitt.

Chamber short; apertural margin generally simple ..... Aspidoceras, Zitt.

In this table I have employed the words *ventral* and *dorsal* in place of *siphonal* and *antisiphonal*, because the appendages to which they apply, and which are placed at the extremity of the last chamber, are not in any way related to the siphon. Two newly established genera must be added, viz. *Pinacoceras*, Mojsis., allied to *Arcestes*, and *Peltoceras*, Waag., intermediate between *Perisphinctes* and *Aspidoceras*.

This table is far from embracing the whole of the family of Ammonitidæ. There are wanting *Ceratites* and *Goniatites*, long since separated from the true Ammonites, all the unrolled Ammonitidæ, already classified in accordance with other characters, and to which the genus *Scaphites* forms the transition; and, lastly, many true Ammonites for which no genus has yet been created, and to which, in the meanwhile, it is necessary still to leave the old name, are necessarily omitted from it.

As the nature of this memoir does not permit me to give

here the descriptions of the newly established genera, I confine myself to citing the works in which they have been described, and giving a few examples of them. In the works indicated, there will be found especially the descriptions of the septa characteristic of each genus. The names of the authors followed by the dates of their publications refer to the bibliographic note at the commencement of this article.

Phylloceras, Suess, 1865, 6. Zittel, 1868, 56; 1870, 153. Neumayr, Jahrb. geol. Reichsanst. 1871, xxi. 297. Heterophylli, von Buch, Ueber Ammoniten, 1832. Triassic, Jurassic, and Cretaceous. Examples: *Ph. Jarbas, heterophyllum, tatricum, Zignodianum, ptychoicum, Thetys.*

Lytoceras, Suess, 1865, 8. Zittel, 1869, 70; 1870, 162. Fimbriati, lineati. Triassic, Jurassic, and Cretaceous. Examples: *L. Simonyi, sphærophyllum, fimbriatum, Eudesianum, Adelæ, Liebigi, subfimbriatum.*

Arcestes, Suess, 1865, 6. Globosi. Triassic. Examples: *A. galeiformis, subumbilicatus, cymbiformis.*

Pinacoceras, Mojsisovics, Verhandl. geol. Reichsanst. 1872, 315. Triassic. Example: *P. Metternichi.*

Trachyceras, Laube, 1869, 15. Triassic. Example: *T. Aon.*

Arietites, Waagen, 1869, 69; 1870, 98. Arietes, Von Buch; partim capricorni. Triassic and Liassic. Examples: *A. Bucklandi, obtusus.*

Ægoceras, Waagen, 1869, 69; 1870, 199. Partim capricorni, coronarii, ornati, macrocephali, &c. Triassic and Liassic. Examples: *Æ. incultum, planorbis, angulatum, Henleyi.*

Amaltheus, Montfort. Waagen, 1869, 69; 1870, 207. Amalthei, Von Buch; partim ornati, falciferi, pulchelli, clypeiformi. Triassic, Jurassic, and Cretaceous. Examples: *A. oxynotus, margaritatus, pustulatus, cordatus, Lamberti.*

Harpoceras, Waagen, 1869, 245, 250; 1870, 202. Falciferi, Von Buch; partim disci, insignes, clypeiformi. Jurassic. Examples: *H. radians, opalinum, hecticum, discus.*

Oppelia, Waagen, 1869, 72; 1870, 203. Œkotraustes, Waagen, 1869, 25. Oppelia, Zittel, 1870, 175; partim denticulati, disci, clypeiformi, ligati. Jurassic and Cretaceous. Zittel has united under this name the two subgenera *Oppelia*, Waag., and *Œkotraustes*, Waag.; he has separated from it the genus *Haploceras*. Examples: *O. subradiata, tenuilobata, flexuosa.*

Haploceras, Zittel, 1870, 166. Jurassic and Cretaceous. Examples: *H. Erato, oolithicum, Grasianum.*

Stephanoceras, Waagen, 1869, 248; 1870, 205. Coronarii, Von Buch; partim macrocephali, coronati, dentati, bullati, &c. Jurassic and Cretaceous. M. Waagen at first made of *Stephano-*

ceras a genus which comprised three subgenera, *Stephanoceras*, *Perisphinctes*, and *Cosmoceras*; subsequently he raised each of these subgenera to the rank of distinct genera. Examples: *S. Humphriesianum, macrocephalum, coronatum, Parkinsoni.*

Perisphinctes, Waagen, 1869, 248. Zittel, 1870, 218. Waagen, 1870, 206. Planulati, Von Buch; partim macrocephali, coronati, coronarii, dentati. Jurassic and Cretaceous. Examples: *P. Martinsi, plicatilis, biplex, Calisto.*

Peltoceras, Waagen, 1871, 91. Includes the species detached from the genera *Perisphinctes* and *Aspidoceras*. Jurassic. Examples: *P. arduennense, transversarium, athleta.*

Cosmoceras, Waagen, 1869, 248. Zittel, 1870, 215. Waagen, 1870, 208. Dentati, ornati. Jurassic and Cretaceous. Examples: *C. calloviense, ornatum, mamillare, verrucosum.*

Simoceras, Zittel, 1870, 207. Tithonic. Examples: *S. volanense, biruncinatum, strictum, catrianum.*

Aspidoceras, Zittel, 1868, 116. Waagen, 1869, 248. Zittel, 1870, 192. Middle and Upper Jurassic and Lower Cretaceous. Examples: *A. bispinosum, cyclotum, orthoceras, Lallierianum, iphicerus, rogoznicense.*

XLIII.—*Description of a new Snake from Madagascar.* By Dr. A. Günther.

The Trustees of the British Museum have purchased some specimens of reptiles from Madagascar, and among them a snake which appears to be the type of a new genus of the family *Dendrophidæ*.

Ithycyphus.

Body compressed, with the abdominal scutes distinctly keeled. Scales smooth, imbricate, without apical groove, in twenty-one series. Ventral scutes less than 200; anal and subcaudals divided. Upper shields of the head normal. One undivided nasal; loreal distinct; one præ-, three postoculars. Pupil round. None of the anterior or middle maxillary teeth enlarged; posterior maxillary tooth grooved.

Ithycyphus caudolineatus.

Body slender, compressed; head narrow, flat, with the snout depressed, obliquely truncated in front. Eye rather small. Vertical bell-shaped. Nostril round, in the middle of the narrow, elongate, single nasal shield. Loreal elongate, as